

4 M is ruthenium or osmium;  
5 X and X<sup>1</sup> are each independently an anionic ligand;  
6 L is a neutral electron donor ligand; and,  
7 R, R<sup>1</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>8</sup>, and R<sup>9</sup> are each independently hydrogen or a substituent selected from  
8 the group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl, C<sub>2</sub>-C<sub>20</sub> alkenyl, C<sub>2</sub>-C<sub>20</sub> alkynyl, aryl, C<sub>1</sub>-C<sub>20</sub>  
9 carboxylate, C<sub>1</sub>-C<sub>20</sub> alkoxy, C<sub>2</sub>-C<sub>20</sub> alkenyloxy, C<sub>2</sub>-C<sub>20</sub> alkynyloxy, aryloxy, C<sub>2</sub>-C<sub>20</sub>  
10 alkoxycarbonyl, C<sub>1</sub>-C<sub>20</sub> alkylthiol, aryl thiol, C<sub>1</sub>-C<sub>20</sub> alkylsulfonyl and C<sub>1</sub>-C<sub>20</sub>  
11 alkylsulfinyl, the substituent optionally substituted with one or more moieties selected  
12 from the group consisting of C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>10</sub> alkoxy, aryl, and a functional group  
13 selected from the group consisting of hydroxyl, thiol, thioether, ketone, aldehyde, ester,  
14 ether, amine, imine, amide, nitro, carboxylic acid, disulfide, carbonate, isocyanate,  
15 carbodiimide, carboalkoxy, carbamate, and halogen.

1 3. (Original) The method of Claim 2 wherein:

2 M is ruthenium;  
3 L is selected from the group consisting of phosphine, sulfonated phosphine, phosphite,  
4 phosphinite, phosphonite, arsine, stibine, ether, amine, amide, imine, sulfoxide, carboxyl,  
5 nitrosyl, pyridine, and thioether; and,  
6 X and X<sup>1</sup> are each independently hydrogen, halide, or a substituent selected from the  
7 group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl, aryl, C<sub>1</sub>-C<sub>20</sub> alkoxide, aryloxy, C<sub>3</sub>-C<sub>20</sub> alkyl diketone,  
8 aryl diketone, C<sub>1</sub>-C<sub>20</sub> carboxylate, arylsulfonate, C<sub>1</sub>-C<sub>20</sub> alkylsulfonate, C<sub>1</sub>-C<sub>20</sub>  
9 alkylthiol, aryl thiol, C<sub>1</sub>-C<sub>20</sub> alkylsulfonyl, and C<sub>1</sub>-C<sub>20</sub> alkylsulfinyl, the substituent  
10 optionally substituted with one or more moieties selected from the group consisting of  
11 C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>10</sub> alkoxy, aryl and halide.

1 4. (Original) The method of Claim 3 wherein:

2 M is ruthenium;  
3 X and X<sup>1</sup> are each independently selected from the group consisting of halide, CF<sub>3</sub>CO<sub>2</sub>,  
4 CH<sub>3</sub>CO<sub>2</sub>, CFH<sub>2</sub>CO<sub>2</sub>, (CH<sub>3</sub>)<sub>3</sub>CO, (CF<sub>3</sub>)<sub>2</sub>(CH<sub>3</sub>)CO, (CF<sub>3</sub>)(CH<sub>3</sub>)<sub>2</sub>CO, PhO, MeO, EtO,  
5 tosylate, mesylate, and trifluoromethanesulfonate;

L is a phosphine of the formula  $PR^3R^4R^5$ , where  $R^3$ ,  $R^4$ , and  $R^5$  are each independently aryl,  $C_1$ - $C_{10}$  alkyl, or cycloalkyl;

R is hydrogen; and,

$R^1$  is phenyl or vinyl, optionally substituted with one or more moieties selected from the group consisting of  $C_1$ - $C_5$  alkyl,  $C_1$ - $C_5$  alkoxy, phenyl, and a functional group selected from the group consisting of hydroxyl, thiol, thioether, ketone, aldehyde, ester, ether, amine, imine, amide, nitro, carboxylic acid, disulfide, carbonate, isocyanate, carbodiimide, carboalkoxy, carbamate, and halogen.

5. (Original) The method of Claim 4 wherein

X and  $X^1$  are each chloride;

L is selected from the group consisting of  $-P(\text{cyclohexyl})_3$ ,  $-P(\text{cyclopentyl})_3$ ,  $-P(\text{isopropyl})_3$ , and  $-P(\text{phenyl})_3$ ; and,

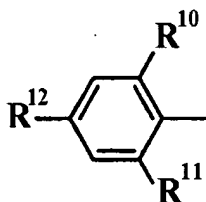
$R^1$  is phenyl or  $-C=C(\text{CH}_3)_2$ .

6. (Original) The method of Claim 5 wherein  $R^6$  and  $R^7$  together form a cycloalkyl or an aryl.

7. (Original) The method of Claim 5 wherein  $R^6$  and  $R^7$  are the same and are hydrogen or phenyl.

8. (Original) The method of Claim 5 wherein  $R^8$  and  $R^9$  are each independently a substituted or unsubstituted aryl.

9. (Original) The method of Claim 5 wherein  $R^8$  and  $R^9$  are each independently of the formula

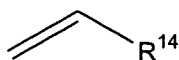


wherein

5  $R^{10}$ ,  $R^{11}$ , and  $R^{12}$  are each independently hydrogen,  $C_1$ - $C_{10}$  alkyl,  $C_1$ - $C_{10}$  alkoxy, aryl, or a  
6 functional group selected from hydroxyl, thiol, thioether, ketone, aldehyde, ester, ether,  
7 amine, imine, amide, nitro, carboxylic acid, disulfide, carbonate, isocyanate,  
8 carbodiimide, carboalkoxy, carbamate, and halogen.

1 10. (Original) The method of Claim 9 wherein  $R^{10}$ ,  $R^{11}$ , and  $R^{12}$  are each independently  
2 hydrogen, methyl or isopropyl.

1 11. (Original) The method of Claim 1 wherein the terminal olefin is of the formula:



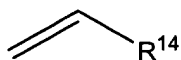
2  
3 wherein  $R^{14}$  is selected from the group consisting of  $C_1$ - $C_{20}$  alkyl,  $C_2$ - $C_{20}$  alkenyl,  $C_2$ - $C_{20}$   
4 alkynyl, aryl,  $C_1$ - $C_{20}$  carboxylate,  $C_1$ - $C_{20}$  alkoxy,  $C_2$ - $C_{20}$  alkenyloxy,  $C_2$ - $C_{20}$  alkynyloxy,  
5 aryloxy,  $C_2$ - $C_{20}$  alkoxycarbonyl,  $C_1$ - $C_{20}$  alkylthio,  $C_1$ - $C_{20}$  alkylsulfonyl and  $C_1$ - $C_{20}$   
6 alkylsulfinyl; and wherein  $R^{14}$  is substituted or unsubstituted.

1 12. (Original) The method of Claim 11 wherein  $R^{14}$  is substituted with one or more moieties  
2 selected from the group consisting of  $C_1$ - $C_{10}$  alkyl,  $C_1$ - $C_{10}$  alkoxy and aryl, wherein the  
3 moiety is substituted or unsubstituted.

1 13. (Original) The method of Claim 12 wherein the moiety substitution is selected from the  
2 group consisting of halogen, a  $C_1$ - $C_5$  alkyl,  $C_1$ - $C_5$  alkoxy, and phenyl.

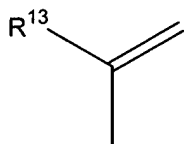
1 14. (Original) The method of Claim 11 wherein  $R^{14}$  contains one or more functional groups,  
2 wherein the functional group is selected from the group consisting of hydroxyl, thiol,  
3 thioether, ketone, aldehyde, ester, ether, amine, imine, amide, nitro, carboxylic acid,  
4 disulfide, carbonate, isocyanate, carbodiimide, carboalkoxy, carbamate, and halogen.

1 15. (Currently amended) The method of Claim ~~11~~ 1 wherein the terminal olefin is of the  
2 formula:



wherein  $\text{R}^{14}$  is a functional group selected from the group consisting of hydroxyl, thiol, thioether, ketone, aldehyde, ester, ether, amine, imine, amide, nitro, carboxylic acid, disulfide, carbonate, isocyanate, carbodiimide, carboalkoxy, carbamate, and halogen, wherein the functional group is substituted or unsubstituted.

16. (Original) The method of Claim 1 wherein the geminal disubstituted olefin is of the formula



wherein  $\text{R}^{13}$  is selected from the group consisting of  $\text{C}_1$ - $\text{C}_{20}$  alkyl,  $\text{C}_2$ - $\text{C}_{20}$  alkenyl,  $\text{C}_2$ - $\text{C}_{20}$  alkynyl, aryl,  $\text{C}_1$ - $\text{C}_{20}$  carboxylate,  $\text{C}_1$ - $\text{C}_{20}$  alkoxy,  $\text{C}_2$ - $\text{C}_{20}$  alkenyloxy,  $\text{C}_2$ - $\text{C}_{20}$  alkynyloxy, aryloxy,  $\text{C}_2$ - $\text{C}_{20}$  alkoxycarbonyl,  $\text{C}_1$ - $\text{C}_{20}$  alkylthio,  $\text{C}_1$ - $\text{C}_{20}$  alkylsulfonyl and  $\text{C}_1$ - $\text{C}_{20}$  alkylsulfinyl; and wherein  $\text{R}^{13}$  is substituted or unsubstituted.

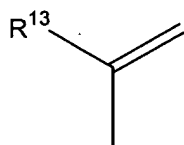
17. (Original) The method of Claim 11 wherein  $\text{R}^{13}$  is substituted with one or more moieties selected from the group consisting of  $\text{C}_1$ - $\text{C}_{10}$  alkyl,  $\text{C}_1$ - $\text{C}_{10}$  alkoxy and aryl, wherein the moiety is substituted or unsubstituted.

18. (Original) The method of Claim 12 wherein the moiety substitution is selected from the group consisting of halogen, a  $\text{C}_1$ - $\text{C}_5$  alkyl,  $\text{C}_1$ - $\text{C}_5$  alkoxy, and phenyl.

19. (Currently amended) The method of Claim ~~14~~ 16 wherein  $\text{R}^{13}$  contains one or more functional groups, wherein the functional group is selected from the group consisting of

3 hydroxyl, thiol, thioether, ketone, aldehyde, ester, ether, amine, imine, amide, nitro,  
4 carboxylic acid, disulfide, carbonate, isocyanate, carbodiimide, carboalkoxy, carbamate,  
5 and halogen.

- 1 20. (Currently amended) The method of Claim 1 wherein the geminal disubstituted olefin  
2 is of the formula



3  
4 wherein  $R^{13}$  is a functional group selected from the group consisting of hydroxyl, thiol,  
5 thioether, ketone, aldehyde, ester, ether, amine, imine, amide, nitro, carboxylic acid,  
6 disulfide, carbonate, isocyanate, carbodiimide, carboalkoxy, carbamate, and halogen,  
7 wherein the functional group is substituted or unsubstituted.

- 1 21. (Original) The method of Claim 1 wherein the disubstituted olefin is a substituted or  
2 unsubstituted  $\alpha$ - functionalized olefin.

- 1 22. (Original) The method of Claim 21 wherein the  $\alpha$ - functionalized olefin is a substituted or  
2 unsubstituted acrylamide.

- 1 23. (Original) The method of Claim 21 wherein the  $\alpha$ - functionalized olefin is selected from  
2 the group consisting of a substituted or unsubstituted acrylate, vinyl ketone, and vinyl  
3 aldehyde.

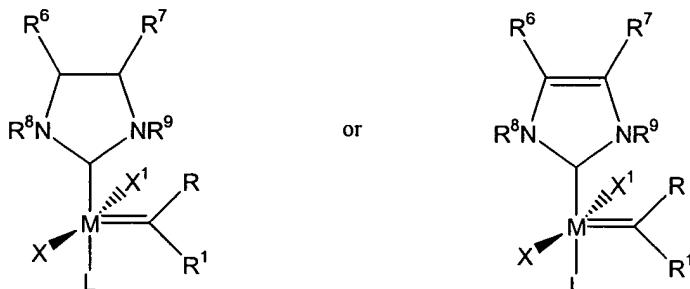
- 1 24. (Cancelled)

- 1 25. (Original) The method of Claim 1 wherein the trisubstituted olefin is prepared at room  
2 temperature.

- 1 26. (Currently amended) A method for preparing di- or tri-substituted olefins comprising  
2 contacting a first substituted or unsubstituted electron deficient olefin with a second  
3 substituted or unsubstituted electron deficient olefin in the presence of a metal carbene  
4 metathesis catalyst, wherein the first and second olefins are the same or different, to  
5 generate a di- or tri-substituted olefin in an intramolecular olefin cross-metathesis  
6 reaction.
- 1 27. (Original) The method of Claim 26 wherein the first olefin is a substituted or  
2 unsubstituted styrene and wherein the second olefin contains an  $\alpha$ - carbonyl group.
- 1 28. (Original) The method of Claim 27 wherein the second olefin is acrylate or acrylamide,  
2 and wherein the second olefin is substituted or unsubstituted.
- 1 29. (Original) The method of Claim 26 wherein the first and second olefins each contain an  
2  $\alpha$ - carbonyl group.
- 1 30. (Original) The method of Claim 26 wherein the first olefin is a substituted styrene and  
2 wherein the substitution occurs on one or more aromatic carbons.
- 1 31. (Original) The method of Claim 26 wherein the first olefin is a substituted styrene and  
2 wherein the substitution occurs on the olefinic carbons.
- 1 32. (Original) The method of Claim 26 wherein the first olefin is an ortho-substituted styrene.
- 1 33. (Original) The method of Claim 26 wherein the first olefin is a terminal olefin and  
2 wherein the second olefin is an  $\alpha$ -functionalized olefin.
- 1 34. (Currently amended) A method for preparing di- or tri-substituted olefins comprising  
2 contacting a substituted or unsubstituted aliphatic olefin with a substituted or  
3 unsubstituted electron-deficient olefin in the presence of a metal carbene metathesis

catalyst to generate a di- or tri-substituted olefin in an intermolecular olefin cross-metathesis reaction.

35. (Original) The method of Claim 34 wherein the metathesis catalyst is of the formula



wherein:

M is ruthenium;

X and X<sup>1</sup> are each independently selected from the group consisting of halide, CF<sub>3</sub>CO<sub>2</sub>, CH<sub>3</sub>CO<sub>2</sub>, CFH<sub>2</sub>CO<sub>2</sub>, (CH<sub>3</sub>)<sub>3</sub>CO, (CF<sub>3</sub>)<sub>2</sub>(CH<sub>3</sub>)CO, (CF<sub>3</sub>)(CH<sub>3</sub>)<sub>2</sub>CO, PhO, MeO, EtO, tosylate, mesylate, and trifluoromethanesulfonate;

L is a phosphine of the formula PR<sup>3</sup>R<sup>4</sup>R<sup>5</sup>, where R<sup>3</sup>, R<sup>4</sup>, and R<sup>5</sup> are each independently aryl, C<sub>1</sub>-C<sub>10</sub> alkyl, or cycloalkyl;

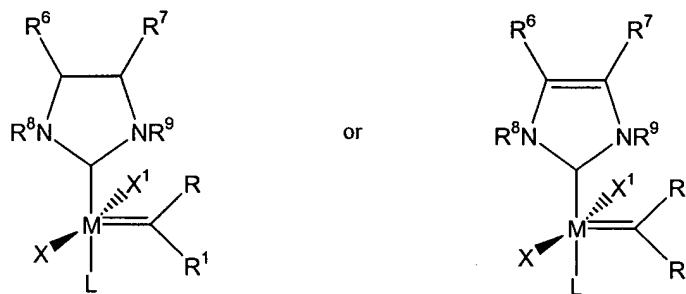
R is hydrogen; and,

R<sup>1</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>8</sup>, and R<sup>9</sup> are each independently hydrogen or a substituent selected from the group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl, C<sub>2</sub>-C<sub>20</sub> alkenyl, C<sub>2</sub>-C<sub>20</sub> alkynyl, aryl, C<sub>1</sub>-C<sub>20</sub> carboxylate, C<sub>1</sub>-C<sub>20</sub> alkoxy, C<sub>2</sub>-C<sub>20</sub> alkenyloxy, C<sub>2</sub>-C<sub>20</sub> alkynyloxy, aryloxy, C<sub>2</sub>-C<sub>20</sub> alkoxy carbonyl, C<sub>1</sub>-C<sub>20</sub> alkylthiol, aryl thiol, C<sub>1</sub>-C<sub>20</sub> alkylsulfonyl and C<sub>1</sub>-C<sub>20</sub> alkylsulfinyl, the substituent optionally substituted with one or more moieties selected from the group consisting of C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>10</sub> alkoxy, aryl, and a functional group selected from the group consisting of hydroxyl, thiol, thioether, ketone, aldehyde, ester, ether, amine, imine, amide, nitro, carboxylic acid, disulfide, carbonate, isocyanate, carbodiimide, carboalkoxy, carbamate, and halogen.

- 1 36. (Original) The method of Claim 34 wherein the aliphatic olefin is a mono-, di- or  
2 trisubstituted olefin.
- 1 37. (Original) The method of Claim 34 wherein the aliphatic olefin is substituted one or more  
2 groups selected from the group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl, C<sub>2</sub>-C<sub>20</sub> alkenyl, C<sub>2</sub>-C<sub>20</sub>  
3 alkynyl, aryl, C<sub>1</sub>-C<sub>20</sub> carboxylate, C<sub>1</sub>-C<sub>20</sub> alkoxy, C<sub>2</sub>-C<sub>20</sub> alkenyloxy, C<sub>2</sub>-C<sub>20</sub> alkynyloxy,  
4 aryloxy, C<sub>2</sub>-C<sub>20</sub> alkoxycarbonyl, C<sub>1</sub>-C<sub>20</sub> alkylthio, C<sub>1</sub>-C<sub>20</sub> alkylsulfonyl and C<sub>1</sub>-C<sub>20</sub>  
5 alkylsulfinyl, wherein the substituent group is substituted or unsubstituted.
- 1 38. (Original) The method of Claim 37 wherein the substituent group is substituted with one  
2 or more moieties selected from the group consisting of C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>10</sub> alkoxy, and  
3 aryl, wherein the moiety is substituted or unsubstituted.
- 1 39. (Original) The method of Claim 38 wherein the moiety is substituted with one or more  
2 groups selected from a halogen, a C<sub>1</sub>-C<sub>5</sub> alkyl, C<sub>1</sub>-C<sub>5</sub> alkoxy, and phenyl.
- 1 40. (Original) The method of Claim 34 wherein the aliphatic olefin includes one or more  
2 functional groups selected from the group consisting of hydroxyl, thiol, thioether, ketone,  
3 aldehyde, ester, ether, amine, imine, amide, nitro, carboxylic acid, disulfide, carbonate,  
4 isocyanate, carbodiimide, carboalkoxy, carbamate, and halogen.
- 1 41. (Original) The method of Claim 34 wherein the aliphatic olefin is 1-hexene and the  
2 electron-deficient olefin is methyl acrylate.



42. (Original) A method for preparing trisubstituted olefins comprising contacting a first substituted or unsubstituted styrene with a second substituted or unsubstituted  $\alpha$ -functionalized olefin in the presence of a metathesis catalyst to form a cross-product and stilbene, and contacting the stilbene with unsubstituted  $\alpha$ -functionalized olefin in the presence of a metathesis catalyst, wherein the catalyst is of the formula:



wherein:

M is ruthenium;

X and X<sup>1</sup> are each independently selected from the group consisting of halide, CF<sub>3</sub>CO<sub>2</sub>, CH<sub>3</sub>CO<sub>2</sub>, CFH<sub>2</sub>CO<sub>2</sub>, (CH<sub>3</sub>)<sub>3</sub>CO, (CF<sub>3</sub>)<sub>2</sub>(CH<sub>3</sub>)CO, (CF<sub>3</sub>)(CH<sub>3</sub>)<sub>2</sub>CO, PhO, MeO, EtO, tosylate, mesylate, and trifluoromethanesulfonate;

L is a phosphine of the formula PR<sup>3</sup>R<sup>4</sup>R<sup>5</sup>, where R<sup>3</sup>, R<sup>4</sup>, and R<sup>5</sup> are each independently aryl, C<sub>1</sub>-C<sub>10</sub> alkyl, or cycloalkyl;

R is hydrogen; and,

R<sup>1</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>8</sup>, and R<sup>9</sup> are each independently hydrogen or a substituent selected from the group consisting of C<sub>1</sub>-C<sub>20</sub> alkyl, C<sub>2</sub>-C<sub>20</sub> alkenyl, C<sub>2</sub>-C<sub>20</sub> alkynyl, aryl, C<sub>1</sub>-C<sub>20</sub> carboxylate, C<sub>1</sub>-C<sub>20</sub> alkoxy, C<sub>2</sub>-C<sub>20</sub> alkenyloxy, C<sub>2</sub>-C<sub>20</sub> alkynyloxy, aryloxy, C<sub>2</sub>-C<sub>20</sub> alkoxycarbonyl, C<sub>1</sub>-C<sub>20</sub> alkylthiol, aryl thiol, C<sub>1</sub>-C<sub>20</sub> alkylsulfonyl and C<sub>1</sub>-C<sub>20</sub> alkylsulfinyl, the substituent optionally substituted with one or more moieties selected from the group consisting of C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>10</sub> alkoxy, aryl, and a functional group selected from the group consisting of hydroxyl, thiol, thioether, ketone, aldehyde, ester, ether, amine, imine, amide, nitro, carboxylic acid, disulfide, carbonate, isocyanate, carbodiimide, carboalkoxy, carbamate, and halogen.

Claims 43-45 (Cancelled)